

CLAIMS:

1. Stepper lens made from fused silica glass which is resistant to compaction when exposed to a dose of high intensity excimer radiation.

2. Fused silica stepper lens which is resistant to compaction when exposed to high intensity excimer radiation, said lens being made by a process comprising the steps of:

- (a) preparing a solution which contains at least one silicon-containing organic compound having the formula $\text{Si}(\text{OR})_4$ or $\text{SiR}(\text{OR})_3$, where R is an alkyl group;
- (b) polymerizing the silicon in the solution to form a SiO_2 gel;
- (c) drying the gel at a rate which causes the gel to fragment into granules having a mean particle size less than about one millimeter;
- (d) sintering the granules at a temperature less than about 1150°C , the density of the granules after sintering being approximately equal to their maximum theoretical density;
- (e) forming a green body from the sintered granules;
- (f) drying and partially sintering the green body in a chamber by (i) raising the temperature of the chamber to above about 1000°C , and (ii) introducing chlorine gas into the chamber and/or subjecting the chamber to a vacuum and/or purging the chamber with an inert gas; and
- (g) fully sintering the green body in a chamber by raising the temperature of the chamber to a temperature above about 1720°C , while purging the chamber with helium or applying a vacuum to the chamber.

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3. Stepper lens according to claim 2 wherein the process includes the additional step after step (g) of hot isostatic pressing the fully sintered green body to a chamber by raising the temperature of the chamber to above about 1150°C and introducing an inert gas into the chamber at a pressure above about 100 psig.

4. Stepper lens according to claim 2 wherein the solution of step (a) contains tetraethylorthosilicate having the formula $\text{Si}(\text{OC}_2\text{H}_5)_4$.

5. Fused silica stepper lens which is resistant to compaction when exposed to high intensity excimer radiation, said lens being made by a process comprising the steps of:

(a) depositing on a starting member a coating of flame hydrolysis-produced glass soot to form a soot preform;

(b) consolidating the soot preform to form a dense glass layer free from particle boundaries; and

(c) forming said dense glass layer into a stepper lens;

said consolidation step being characterized in that it comprises heating said soot preform to a temperature within the consolidation temperature range for a time sufficient to cause said soot particles to fuse and form a dense glass layer, and simultaneously subjecting the soot preform to a stream of a substantially dry, hydrogen-free, chlorine containing atmosphere.

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